OPERATING INSTRUCTIONS

INSTRUMENT SHOP

TYPE 1211-C

UNIT OSCILLATOR

MP MASTER
MA33094

GENERAL RADIO COMPANY

OPERATING INSTRUCTIONS

TYPE 1211-C

UNIT OSCILLATOR

Form 1211-0100-F
July, 1962

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West Concord, Massachusetts, USA

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

SPECIFICATIONS

Frequency Range: 0.5 to 50 Mc in two ranges.

Frequency Calibration Accuracy: ±2 percent at no load.

Warmup Frequency Drift: 0.4% ±0.2%, largest at the high-frequency end of each range.

Frequency Controls: A two-position range switch, a six-inch dial with approximately logarithmic calibration and a slow-motion dial to indicate frequency increments of 0.2 percent per dial division.

Output System: Output available at a Type 874 coaxial connector at rear of instrument. Adjacent ground terminal also permits connection by Type 274-M Plug. Output is controlled by a 100-division dial.

Output Power: With Type 1203-B Unit Power Supply, at least 200 milliwatts into 50-ohm load at any frequency. Over the 0.5-to-5-Mc range, average output is approximately 1 watt; over the 5-to-50-Mc range, 0.4 watt. See below.

Modulation: Plate modulation of 30% at audio frequencies can be produced by external source of 50 volts. Input impedance is about 8000 ohms. For amplitude modulation free from incidental fm, a Type 1000-P6 Crystal Diode Modulator can be used at carrier frequencies above 10 Mc.

Circuit: Hartley oscillator coupled directly to output. Capacitance and inductance are simultaneously changed for frequency variation.

Power Supply Requirements: 320 volts at 50 ma dc. 6.0 volts at 0.75 ampere ac or dc.

Power Supply Recommended: Refer to Table of Accessories, page 3.

Tube: Type 5763 miniature vhf beam-power tube.

Mounting: Oscillator on aluminum casting is shielded with a spun aluminum cover. Assembly mounted on an L-shaped panel and chassis. Adaptor panels for relay-rack mounting are available.

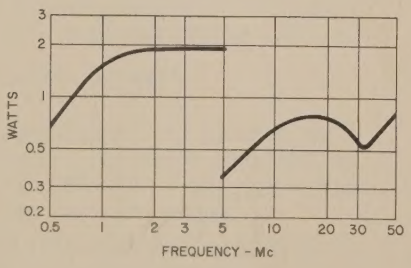
Accessories Supplied: Type 874-R22 Patch Cord, Type 874-Q2 Adaptor, telephone plug.

Dimensions: Width 8, height 7½, depth 12 inches (205 by 192 by 305 mm) over-all.

Weight: 11½ pounds (5.3 kg).

U.S. Patent No. 2,548,457.

Typical output curves of Type 1211-C Unit Oscillator. Output with a regulated 300-volt power supply is reduced to about 0.8 of the values shown.



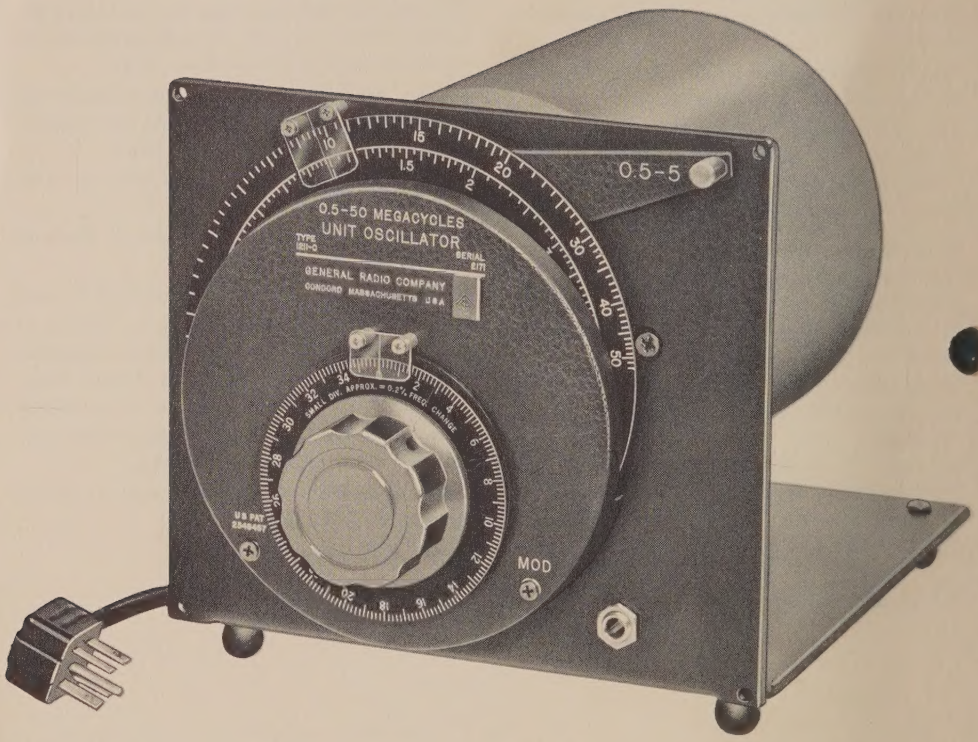


Figure 1. Type 1211-C Unit Oscillator.

SECTION 1

INTRODUCTION

1.1 PURPOSE.

The Type 1211-C Unit Oscillator (Figure 1) is a small, shielded, general-purpose oscillator of moderate power output, covering the frequency range of 0.5 to 50 megacycles in two logarithmic ranges. This convenient oscillator can be used to drive bridges, slotted lines, impedance comparators, and other measuring equipment. It can be modulated from an external source.

1.2 DESCRIPTION.

1.2.1 CIRCUIT. A Hartley circuit with a Type 5763 nine-pin miniature beam-power tube is used in the Type 1211-C Unit Oscillator. The output control is tapped across a portion of the tuned circuit for the low-frequency range, and is coupled to the tuned circuit by a pickup coil for the high-frequency range. Five resistors with a combined value of 2000 ohms are included in the plate-supply circuit to protect the oscillator tube.

A special circuit, with a nonlinear Thyrite resistor, is included in the grid circuit of the 0.5-to-5-Mc low-frequency oscillator to reduce distortion, but the circuit is not used in the 5-to-50-Mc range. Carrier distortion is under 5% at all frequencies.

1.2.2 FREQUENCY CONTROLS. The range switch is operated by a long lever above the main dial. There are two positions, indicated by the ranges marked on the lever: 0.5 to 5 Mc and 5 to 50 Mc. The main frequency dial carries a separate calibration for each range.

The small slow-motion dial that drives the main dial is calibrated to indicate directly small percentage increments in frequency. Each division of this dial corresponds approximately to a 0.2-percent change in frequency, except at the ends of the main frequency dial.

Both capacitance and inductance of the tuned circuit are varied simultaneously to produce the wide 10-to-1 frequency span for each range. The capacitance varies about 40 to 1, the inductance about 2.5 to 1. Two sickle-shaped tapered cores, one of iron-dust the other of aluminum (see Figure 3) are mounted to turn with the tuning-capacitor

shaft. As the frequency dial is rotated, the active core material within the inductor varies smoothly from the full dust core for maximum inductance through a minimum core to a full aluminum core for minimum inductance. The shapes of the cores and of the capacitor plates are designed for approximately logarithmic frequency change with angular rotation over the 10-to-1 range.

1.2.3 OUTPUT CONTROLS AND TERMINALS. The output is controlled by a 250-ohm resistive voltage divider (R102) mounted inside the large shield cover at the rear of the instrument. The dial of this control is calibrated in 100 arbitrary units, with maximum output at full clockwise rotation where the dial indicates zero. Typical characteristic curves of output voltage with a 50-ohm load are shown in the specifications. If the load is excessive, the instrument may stop oscillating unless the output control is set back far enough to reduce the coupling to the load.

The output terminals are at the rear of the instrument, near the output control. The output connector is a Type 874 Coaxial Connector with a grounding terminal beside it.

1.2.4 SHIELDING. All supply leads and the modulation circuit are well filtered to reduce leakage. The large cylindrical cover that fits over the oscillator has to be clamped tightly by a metal strap.

1.2.5 MODULATION. Amplitude modulation is obtained by insertion of external voltages into the cathode circuit. For small frequency variations, external voltages are inserted into the grid circuit.

Thirty-percent amplitude modulation of the oscillator introduces incidental frequency modulation which varies from about 1000 to 10,000 cycles, over each one of the two frequency ranges. Amplitude modulation, essentially free from frequency modulation, can be obtained at carrier frequencies above 10 Mc by the use of a Type 1000-P6 Crystal Diode Modulator.

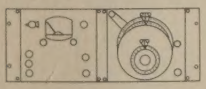
1.2.6 SWEEP AND DIAL DRIVES. The frequency dial of the Type 1211-C Unit Oscillator can be mechanically swept back and forth by the Type 1750-A Sweep Drive, the Type 908-P Synchronous Dial Drive, or the Type 908-R X-Y Dial Drive, and the amplitude of the oscillator output can be held constant by the Type 1263-B Amplitude-Regulating Power Supply. This is useful to simulate a sweep generator for recording or to display frequency characteristics on an oscilloscope.

1.3 ACCESSORIES.

Supplied with the Unit Oscillator are a Type 874-R22 three-foot shielded Patch Cord, a Type 874-Q2 Adaptor, and a phone plug. The adaptor can be plugged either into the output connector or into the output end of the cable, and permits direct connection either by wire leads

or by standard banana-plug connections. When complete shielding of the load is desired, one of the Type 874 panel connectors listed at the rear of this manual should be mounted on the shield of the load.

TABLE OF ACCESSORIES AVAILABLE

Accessory and Function	Instrument	Remarks
POWER SUPPLIES		
Standard	Type 1203-B Unit Power Supply	115-v, 50-60-cps line
Stabilized plate voltage	Type 1201-B Unit Regulated Power Supply	105-125-v, 50-60-cps line (reduced output)
Adjustable regulated plate voltage	Type 1205-B Adjustable Regulated Power Supply	105-125-v, 60-cps line (reduced output)
Constant output level vs frequency	Type 1263-B Amplitude Regulating Power Supply with Type 874-VR Voltmeter Rectifier, Type 874-Q6, Adaptor, and Type 274-NF Patch Cord.	115- or 230-v, 50-60-cps line (reduced output)
MODULATORS		
Plate Modulation	Type 1214-A Unit Oscillator	400- and 1000-cps output, 115-v, 40-60-cps line
Absorption modulation with no incidental fm	Type 1000-P6 Crystal-Diode Modulator	Requires modulation source Carrier range starts at 10 Mc. Maximum output 10 mv.
SWEEP DRIVE		
Automatic frequency sweep	Type 1750-A Sweep Drive Type 908-P Synchronous Dial Drive Type 908-R96 X-Y Dial Drive	Type 1263-B Amplitude-Regulating Power Supply recommended to keep oscillator level constant and for square wave modulation.
RELAY-RACK PANELS		
	Type 480-P408	For Type 1211-C only
	Type 480-P416	For Types 1263-B and 1211-C A clip is provided for mechanical connection at the rear.
ADAPTORS - available for connecting Type 874 coaxial output terminals of oscillator to other coaxial systems. See Table at rear of manual.		

SECTION 2

OPERATING PROCEDURE

2.1 INSTALLATION.

The Type 1211-C Unit Oscillator is supplied with the oscillator tube installed and is ready for use when connected to a power supply. A multipoint plug connector at the end of the power cable provides direct connection to General Radio Unit Power Supplies. The Type 1203-B Unit Power Supply will usually be satisfactory. The Type 1201-B Unit Regulated Power Supply or the Type 1205-B Adjustable Regulated Power Supply provides regulated plate power but output is reduced slightly. If line-voltage fluctuations are excessive, a line-voltage regulator should be used in addition.

For some applications, it is desirable that the output level remain constant as the frequency is varied. The Type 1263-B Amplitude-Regulating Power Supply automatically controls the plate voltage to keep the oscillator output at a constant level of two volts or less. This power supply also provides 1-kc square-wave modulation from an internal generator. The following parts are required to couple the output of the Type 1211-C Unit Oscillator to the Type 1263-B Amplitude-Regulating Power Supply: a Type 874-VR Voltmeter Rectifier, a Type 874-Q6 Adaptor, and a Type 274-NF Patch Cord.

Type 480-P408 Panel Extensions are available for mounting the Type 1211-C in a standard 19-inch relay-rack. Type 480-P416 Panel Extensions are used to rack-mount the oscillator with the Type 1263-B Amplitude-Regulating Power Supply.

2.2 OPERATION.

After turning on the power supply, adjust frequency and output (with the knob at the rear of the instrument). The frequency of the oscillator varies for some time after the power has been applied, until the temperature has stabilized. The warm-up drift depends on frequency and varies considerably from one oscillator to another. It is usually 0.4% ± 0.2% and is largest at the high-frequency end of each range where the time constant is about 15 minutes. At the lower end of each range, the time constant is about 30 minutes.

2.3 AMPLITUDE MODULATION.

An audio oscillator can be used to provide direct amplitude modulation over the audio-frequency range. The audio-oscillator circuit must supply a dc path and must be capable of carrying 50 ma dc. Connect the audio oscillator into the cathode circuit at the MOD jack on the right side of the panel. Recommended is the Type 1214-A Unit Oscillator, which delivers about 50 volts at either 400 or 1000 cycles per second and yields about 30-percent modulation at full output. Envelope distortion is under 4% over most of the frequency range. A telephone plug is supplied for connection to the MOD jack.

2.4 FREQUENCY VARIATION.

A small amount of frequency variation can be obtained by insertion of external voltages into the grid circuit of the oscillator tube. To do this, the link connecting tube pin 7 to anchor terminal 11 must be shifted to anchor terminal 12, as indicated in the wiring diagram and in Figure 3. External voltages then can be applied at the MOD jack on the front panel. Thirty volts will produce a frequency shift of about 20 kc in the low-frequency range but only 2 kc in the high-frequency range.

2.5 SWEEP AND DIAL DRIVES.

The Type 1750-A Sweep Drive can be coupled either to the slow-motion dial or to the main frequency dial of the Unit Oscillator. When the main frequency dial is coupled to the Sweep Drive, the sweep rate should be restricted to one excursion per second or less. The slow-motion dial can be driven at rates up to 5 cycles per second. The magnitude and center position of the sweep arc, as well as the sweep rate, can be set by controls on the Sweep Drive panel. The Sweep Drive also provides horizontal deflection voltage, proportional to shaft rotation, for an oscilloscope. A blanking contactor eliminates the return trace.

The Type 908-P Synchronous Dial Drive is useful with graphic recorders that are running at constant speed. The Type 908-R X-Y Dial Drive produces a sweep voltage proportional to shaft rotation to drive the independent variable axis of an x-y plotter or of an oscilloscope.

When the Type 1211-C Unit Oscillator is driven by a sweep or dial drive, all moving parts in the oscillator must be lubricated in accordance with paragraph 3.5.

SECTION 3

SERVICE AND MAINTENANCE

3.1 WARRANTY.

We warrant that each new instrument sold by us is free from defects in material and workmanship and that properly used it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel will be repaired, or at our option, replaced without charge, except for tubes or batteries that have given normal service.

3.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

3.3 ACCESS TO COMPONENTS.

With the shield cover removed, all but the components of the rf filters are accessible, and they can be checked with an ohmmeter without opening the filter cavity. When replacing the shield cover, tighten the shield strap to ensure low leakage.

For direct access to the rf filter components, remove the frequency dials and the panel. When replacing the dials, set the main dial at its reference line (long line below the lower frequency calibrations) with the tuning capacitor plates at full mesh.

3.4 VACUUM-TUBE DATA.

The following table gives tube-socket voltages and resistances, measured from socket pin to ground. The dc voltages were measured with a 20,000-ohm-per-volt meter whose full-scale ranges were 10, 50, 250, and 1000 volts. The instrument was powered by a Type 1203-B Unit Power Supply from a 115-volt, 60-cycle power line. The frequency controls were set at 0.5 Mc.

The resistance measurements were made with the power supply disconnected and all the terminals of PL102 shorted together. Voltage and resistance values may vary as much as ±20% from those given in the table.

		Volts to Gnd		Resistance to Gnd	
Pin No.	Element	LO Range	HI Range	LO Range	HI Range
1	Plate	340 v	225 v	1.3 kΩ	1.4 kΩ
3	Sup Grid	0	0	0	0
4	Heater	0	0	0	0
5	Heater	6.3 v ac	6.3 v ac	4 Ω	4 Ω
6	Screen Grid	125 v	220 v	56 kΩ	9.7 kΩ
7	Cathode	10 v		440 Ω	440 Ω
8, 9	Control Grid	1 v		10.4 kΩ	10.4 kΩ

3.5 LUBRICATION.

When the Type 1211-C Unit Oscillator is driven by a Sweep or Dial Drive, all moving parts in the oscillator must be properly lubricated. This includes an occasional drop of light oil at the ball bearings, and occasional relubrication of the pinion gear in the dial assembly. Wipe off old lubricants before applying new lubrication. Recommended lubricants are Anderol L-401-D instrument oil and Lubrico H101 light grease.

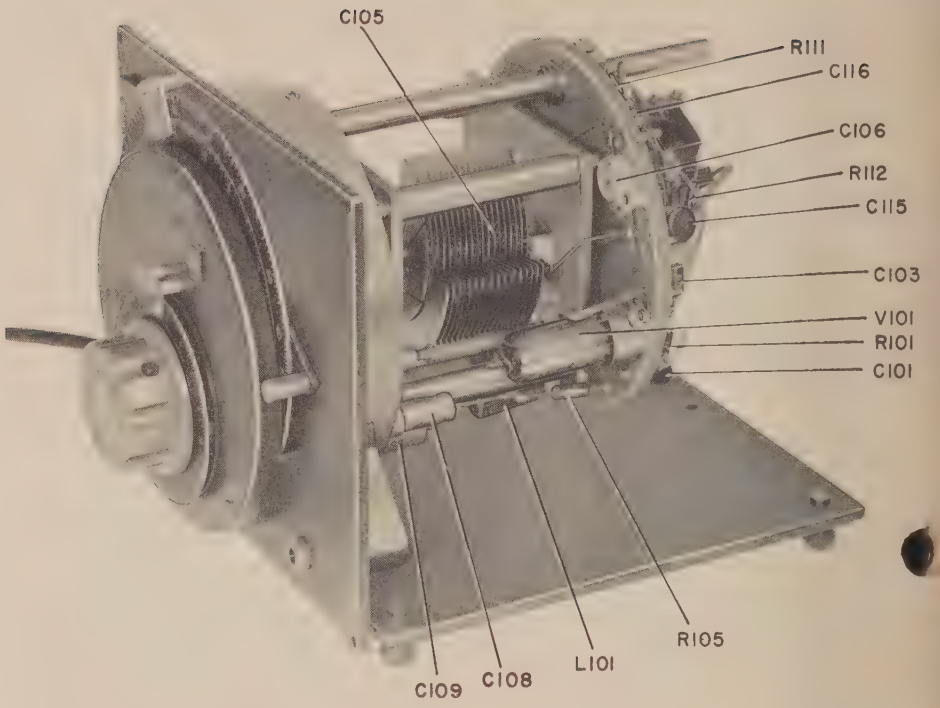


Figure 2. Interior view of the Type 1211-C.

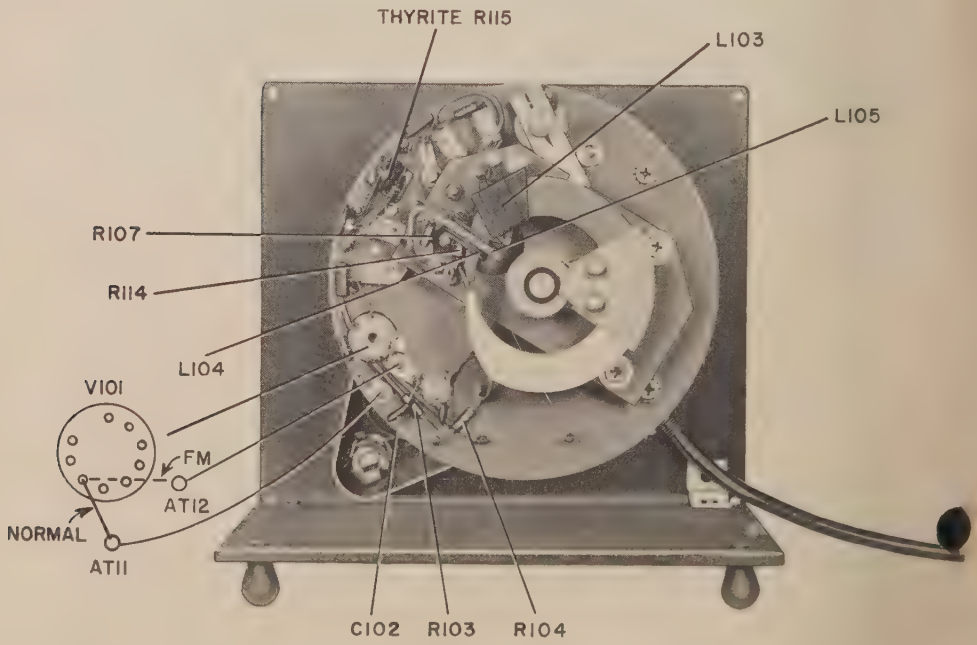


Figure 3. Rear interior view of the Type 1211-C.

ENGRAVING FOR S101

(0.5-5 RANGE SHOWN)

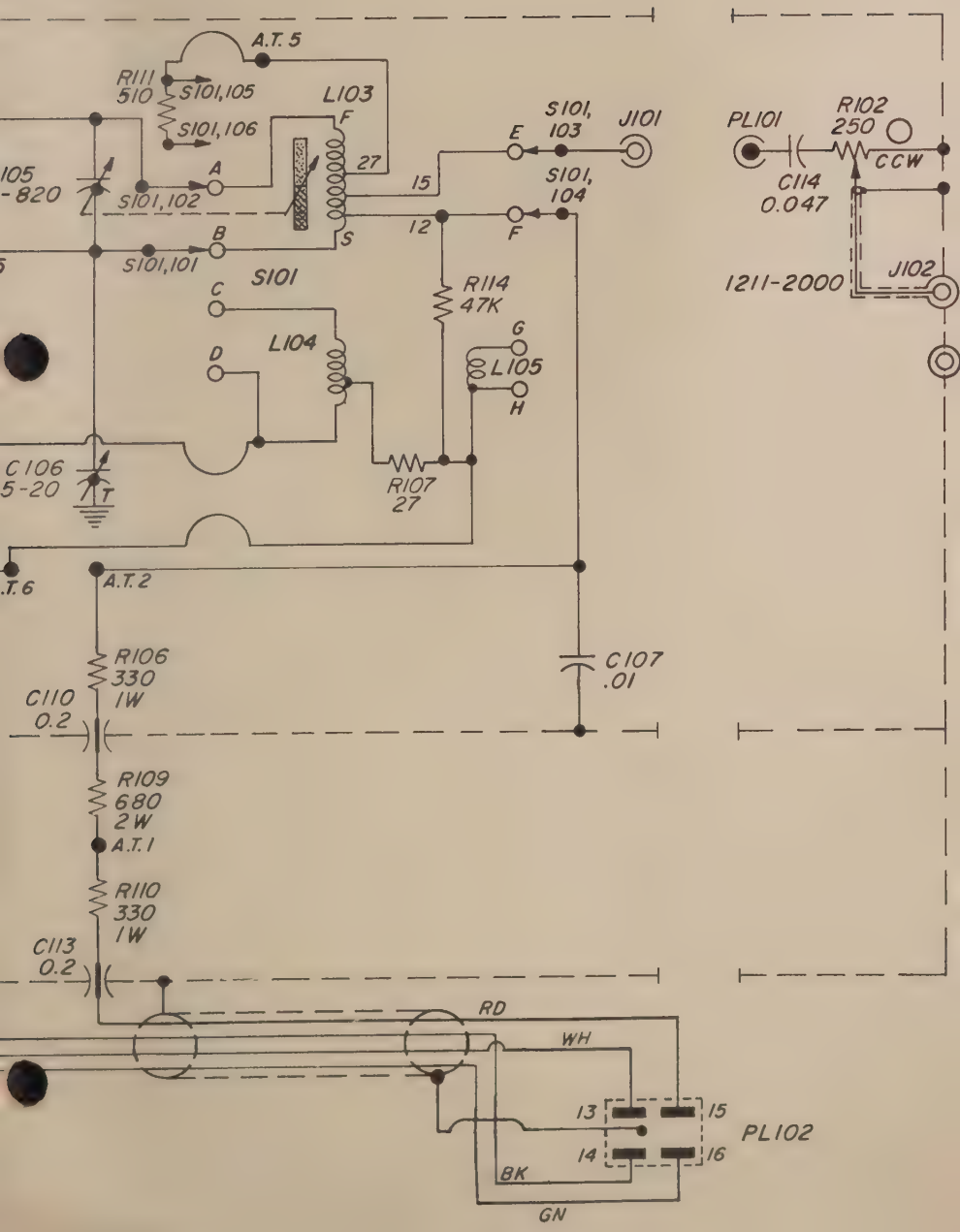


TABLE OF TYPE 874 COMPONENTS

TYPE 874- CONNECTORS

TYPE	FOR CABLE TYPE: 874-A2 (50 Ω)	874-A3, RG-29/U, -55/U, -58/U, etc.	Rg-8/U, -9/U, -116/U, etc.	RG-59/U, -62/U, -116/U, etc.	single-wire lead
CABLE	-CA	-C58A	-C8A	-C62A	
CABLE, LOCKING	-CLA	-CL58A	-CL8A	-CL62A	
PANEL, FLANGED	-PBA	-PB58A	-PB8A	-PB62A	
PANEL, LOCKING	-PLA	-PL58A	-PL8A	-PL62A	-PLT
PANEL, LOCKING, RECESSED	-PRLA	-PRL58A	-PRL8A	-PRL62A	-PRLT

BASIC (AIR-LINE) 50 Ω CONNECTOR - 874-B

BASIC LOCKING CONNECTOR - 874-BL

TYPE 874- ADAPTORS

TO TYPE	874-	TO TYPE	874-
BNC plug	QBJA	TNC plug	QTNJ
plug	QBJL*	plug	QTNJL*
jack	QBPA	jack	QTNP
C plug	QCJA	UHF plug	QUJ
plug	QCJL*	(cable) plug	QUJL*
jack	QCP	jack	QUP
HN plug	QHJA	UHF 7/8 in.	QU1A
jack	QHPA	(air line) 1-5/8 in.	QU2
		3-1/8 in.	QU3A
LC plug	QLTJ	double plug or jack	Q2
jack	QLPA	binding post pair	Q9
LT plug	QLTJ	274-NO patch cord	QN6
jack	QLTP		
N plug	QNJA		
plug	QNJL*		
jack	QNP		
SC plug	QSCJ		
plug	QSCJL*		
jack	QSCP		

* Locking Type 874 Connector.

Example: To connect Type 874 to a Type N jack, order Type 874-QNP.

OTHER COAXIAL ELEMENTS

874-	
A2	50 Ω cable, 0.365" OD
A3	50 Ω cable, 0.206" OD
BM	300 Ω bal. termination
D20, D50	20-, 50-cm adjustable stubs
EL	90° ell
F185	185-Mc low-pass filter
F500	500-Mc low-pass filter
F1000	1000-Mc low-pass filter
F2000	2000-Mc low-pass filter
F4000	4000-Mc low-pass filter
G3, G6	3-, 6-, 10-, 20-db attenuators
G10, G20	
GA	adjustable attenuator
JR	rotary joint
K	coupling capacitor
L10, L20, L30	10-, 20-, 30-cm rigid air lines
LA	33-58 cm adjustable line
LK10, LK20	constant Z adjustable lines
LR	radiating line
LT	trombone constant Z line
M	component mount
MB	coupling probe
MR	mixer-rectifier
T	tee
UB	balun
VC	variable capacitor
VI	voltmeter indicator
VQ	voltmeter detector
VR	voltmeter rectifier
W50	50 Ω termination
W100	100 Ω termination
W200	200 Ω termination
WM	50 Ω termination
WN, WN3	short-circuit terminations
WO, WO3	open-circuit terminations
X	insertion unit
XL	series inductor
Y	cliplock
Z	stand

The above is a partial listing. For complete details, refer to the General Radio catalog.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

EMerson 9-4400 Mission 6-7400

DISTRICT OFFICES

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General Radio Company
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